

COURSE OUTLINE – subject to changes :

- L-1 Mon 9 Jan welcome to mcs 572 – supercomputing – measuring performance
- L-2 Wed 11 Jan scalability – types of parallel computing
- L-3 Fri 13 Jan high level parallel processing
- Mon 16 Jan **Martin Luther King Day, no classes**
- L-4 Wed 18 Jan basics of Message Passing (MPI) – broadcasting data
- L-5 Fri 20 Jan using MPI to write parallel programs – evaluating parallel programs
- L-6 Mon 23 Jan pleasingly parallel programs – Monte Carlo simulation
- L-7 Wed 25 Jan static and dynamic task assignments – load balancing
- L-8 Fri 27 Jan partitioning and divide-and-conquer strategies
- L-9 Mon 30 Jan shared memory parallelism – an introduction to OpenMP
- L-10 Wed 1 Feb concurrent processes and threads – an introduction to pthreads
- L-11 Fri 3 Feb an introduction to the Intel Threading Building Blocks
- L-12 Mon 6 Feb parallel sorting algorithms – parallel quicksort
- L-13 Wed 8 Feb numerical integration on parallel computers
- L-14 Fri 10 Feb parallel fast Fourier transforms – the isoefficiency function
- L-15 Mon 13 Feb pipelining to create parallel algorithms
- L-16 Wed 15 Feb applying pipelining to sorting
- L-17 Fri 17 Feb solving triangular linear systems with a pipeline
- Project One due on Monday 20 February by noon**
- L-18 Mon 20 Feb synchronizing computations with linear, tree, and butterfly barriers
- L-19 Wed 22 Feb parallel iterative methods to solve linear systems
- L-20 Fri 24 Feb solving the heat distribution problem – domain decomposition methods
- L-21 Mon 27 Feb the N-body problem
- L-22 Wed 29 Feb parallel Gaussian elimination
- L-23 Fri 2 Mar parallel linear algebra: the PLASMA software package
- L-24 Mon 5 Mar disk-based parallelism
- L-25 Wed 7 Mar review of the first half of the course
- L-26 Fri 9 Mar **midterm exam – either in class or take home**
- L-27 Mon 12 Mar programming massively parallel processors: the GPU
- L-28 Wed 14 Mar architecture of a modern GPU – programming models
- L-29 Fri 16 Mar evolution of GPU computing – scalable GPUs
- Project Two due on Monday 26 March by noon**
- L-30 Mon 26 Mar introduction to CUDA – data parallelism and program structure
- L-31 Wed 28 Mar matrix-matrix multiplication – device memories, data transfer
- L-32 Fri 30 Mar kernel functions and threading – execution configurations
- L-33 Mon 2 Apr CUDA thread organization – grid of thread blocks
- L-34 Wed 4 Apr using blockIdx and threadIdx in matrix-matrix multiplication
- L-35 Fri 6 Apr synchronization, thread assignment, scheduling and latency
- L-36 Mon 9 Apr CUDA memories: access efficiency and device memory types
- L-37 Wed 11 Apr reducing global memory traffic – tiled matrix multiplication
- Project Three due on Friday 13 April by noon**
- L-38 Fri 13 Apr performance considerations – sum reduction algorithms
- L-39 Mon 16 Apr memory access patterns for coalescing in matrix multiplication
- L-40 Wed 18 Apr advanced MRI reconstruction – FFT on GPU
- L-41 Fri 20 Apr molecular visualization – memory coalescing
- L-42 Mon 23 Apr presentation of projects or review for final exam
- L-43 Wed 25 Apr presentation of projects or review for final exam
- L-44 Fri 27 Apr presentation of projects or review for final exam

Monday 30 April - Friday 4 May : Final Examination – date, time and room to be announced.